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Persistence of Personal Health Practices over a 1-Year Period

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The analyses upon which this report is based were supported by a Special Emphasis Research Career Award to the author from the National Institute on Aging (KO1-AG00266-02).

The data which form the basis of this report were available through a public use tape obtained from the Inter-University Consortium for Political and Social Research. The data for the National Survey of Personal Health Practices and Consequences (U.S.) 1979-80 were collected by the National Center for Health Statistics, Public Health Service. Neither the collector of the original data nor the consortium bears any responsibility for the analyses or interpretations in this report.

Tearsheet requests to Dr. Rakowski.

Synopsis

A large amount of research has been devoted to identifying the psychosocial and demographic correlates of personal preventive health practices. An additional factor to consider, however, is the stability of personal health practices over time. At least over short periods, the prediction of current behavior may be substantially improved by having information about an individual's previous performance of the practice being studied. To address this question, data from Wave 1 (1979) and Wave 2 (1980) of the National Survey of Personal Health Practices were examined. Using nine health practices as indices, performance reported at Wave 1 was used to predict performance of that same practice as reported at Wave 2, 1 year later. A two-step analysis strategy was followed to estimate how much more variance could be explained when the behavioral reports were added to a list of psychosocial and demographic predictors.

Results showed that over the 1-year interval, the Wave 1 behavioral reports were by far the strongest predictors of their corresponding measures obtained at Wave 2. The explained variance was increased substantially for most of the nine health practices, suggesting a strong tendency for persistence of the practices. Psychosocial and demographic variables tended to account for much smaller amounts of variance and often dropped out of the prediction equation when the Wave 1 behavior report was entered in the second step of analysis. Health practices other than the corre-

sponding Wave 1 index did not improve prediction of the Wave 2 index greatly. The tendency for previous behavior to persist may overshadow the influence of other factors and account for the modest amounts of explained variance that are usually found for psychosocial and demographic indices in cross-sectional surveys. Although stability does not imply rigidity or impossibility of change, the strength of prediction found in these data attest to the "force of habit" that community interventions can encounter.

THE PROGRESS THAT CAN BE MADE toward reaching national objectives of disease prevention and health promotion depends greatly upon our ability to encourage the consistent performance of multiple good health practices on a community-wide level. To provide a baseline of information against which to assess progress, much effort has been devoted to monitoring the distribution of health practices across subgroups of the population (for example, age, gender, education, income, ethnicity, references *1–4*). These descriptive surveys are complemented by research and demonstration programs designed to effect behavior change in communities and other population groups (*5–8*). Achieving stability or persistence of newly adopted lifestyle habits is a key factor in meeting national objectives of reduced mortality and morbidity.

Another objective of research is to identify the antecedent or predictor variables that help to maintain personal health practices. Psychosocial indices and demographic characteristics are frequently used in these studies, and progress is being made toward unravelling the complex interaction among these predictors. Attention is often directed toward the explained variance in statistical procedures like multiple regression, to get an idea of how much of the variability that people show on any one health practice can be accounted for or explained by the predictor variables that are used. It is still the case, though, that the explained variance for health practices differs widely across studies, that the variance accounted for by any one predictor is usually small, and that the total explained variance has been modest, even among results that are considered relatively strong (*9–14*). A large proportion of variance remains to be explained by variables that have not yet been incorporated or sufficiently investigated by researchers.

In this regard, it has become increasingly evident that a key research question is whether personal health practices tend to "track" along an individual's life. And, if they do, what is the extent of that stability? If existing behavior tends to persist even by simple force of habit, then the best predictors of a current health behavior may in fact be *earlier* assessments of that behavior. Knowledge of this force of habit across several health practices might assist program planners in anticipating the difficulties (or receptivity by the public) that they will encounter during community health promotion initiatives.

I investigated stability among health practices, using data from Waves 1 (1979) and 2 (1980) of the National Survey of Personal Health Practices and Consequences (NSPHPC). One question was the amount by which the explained variance could be increased by using the Wave 1 assessment of the target health practice to predict the Wave 2 report.

There are indications from other studies that past behavior patterns will be effective predictors of current health practices. Breslow and Enstrom (*15*) reported on the stability of the Alameda County health practices index over a 9½-year followup. Percentage data tended to show notable consistency in the seven-habit total-count index. In groups that were defined by number of health practices, between 31 percent and 63 percent of the members reported the same number of habits at both assessments. Shifts between the extremes were especially infrequent. Mechanic (*16*) reported on a 16-year followup of then young adults, who were initially surveyed as school children. Of the six behaviorally oriented questions that were similarly worded at both times, three exhibited low but statistically significant correlations over that long period, which also covered the transition from childhood to young adulthood.

Secular trends in national-level parameters of risk factor prevalence, especially when accompanied by changes in morbidity and mortality rates, also suggest that behavior patterns must persist in order for these trends to be reflected on such a large scale (*17,18*). Finally, the dropout and recidivism rates often observed in intervention programs such as smoking cessation, diet, and exercise

suggest the strength of the environmental and personal factors which help to maintain the undesired practices. The 16-year interval used by Mechanic (*16*) and the 9½-year interval of Breslow and Enstrom (*15*) are long periods and constituted strict tests of stability. In contrast, the 1-year interval between Waves 1 and 2 of the NSPHPC (1979–80) may provide an upper estimate.

A second question is whether an improvement in prediction will be attributable primarily to the earlier assessment of the particular targeted health practice, or will information about other health behaviors also produce a substantial increment? The low to only moderate correlations that are usually observed among diverse health practices (*19,20*) suggest that the improvement in prediction will be restricted to the earlier (Wave 1) assessment of the target practice itself.

A final question pertains to the possibility that stability of health practices will differ across strata of the population. For example, on the assumption that habits become established with age, will different cohorts show different degrees of behavioral consistency? Similar questions could be posed for population subgroups defined by health status, income, education, ethnicity, gender, or any of the numerous variables that could influence personal health practices. Variation in the stability of behavior across strata could provide a new approach to defining groups in the population who are considered at risk of developing illnesses or other impairments.

Methods

Sample. Data for this report are based upon Waves 1 and 2 of the National Survey of Personal Health Practices and Consequences. Wave 1 was conducted during the spring of 1979 (N = 3,025), with Wave 2 serving as a 1-year followup in 1980 (N = 2,436). Original sample selection for Wave 1 was based upon a three-stage stratified cluster design. County telephone exchanges in the coterminous United States were randomly selected, followed by the selection of a random sample of numbers within each exchange proportional to the numbers served by that exchange. Finally, there was a random selection of an eligible respondent within each sampled household. All respondents were civilian and noninstitutionalized. The age range of the Wave 1 sample was restricted to ages 20–64. Characteristics of Wave I participants were compared with those of participants in the 1979 National Health Interview Survey (*21*), which had a larger national sample. Some discrepancies were noted, primarily a smaller representation of men in the 50–64 group and a higher educational attainment in the NSPHPC. However, analyses indicated that these differences in proportional representation did not result in biases on other variables.

Wave 1 to Wave 2 comparison. A total of 589 persons were not reinterviewed for Wave 2, yielding a reinterview rate of 80.5 percent. The gender distribution of the Wave 2 sample was male = 933 (38.3 percent); female = 1,503 (61.7 percent). The ethnic-racial coding included white, non-Hispanic = 2,051 (84.2 percent), black = 194 (8.0 percent), Hispanic = 128 (5.3 percent), and other groups = 63 (2.6 percent). In regard to marital status, 1,644 (67.5 percent) were married, and 792 (32.5 percent) were nonmarried. In addition, 12 years or fewer of education was reported by 58.2 percent, while 19.1 percent reported at least a bachelor's degree or beyond.

Using data from Wave 1, persons not interviewed at Wave 2 were compared with persons who were interviewed at both times. The variables for comparison were chosen to correspond to those being used as predictors of health practices at Wave 2, as described subsequently. Chi-square results indicated no significant differences in regard to groups defined by gender, age, bed-days due to illness, limitation of activity due to illness, having a regular source of health care, employment (full-time versus other), and residential location (Standard Metropolitan Statistical Area vs. non-SMSA).

Statistically significant, differential rates of noninterview did occur for certain groups in the sample. As an index of the excess dropout, the difference between the expected number of persons in Wave 2 and the number who actually were interviewed was calculated, using information from the chi-square contingency table. This difference was then expressed as a percentage of the number of persons in the group at Wave 1. Therefore, if the Wave 2 interview rate at each level of a variable (for example, three levels of self-rated health), was about equal to the overall reinterview rate of 80.5 percent, the smaller the difference would be at each level of the variable between the numbers of persons expected and actually interviewed. The smaller this difference was, the nearer the calculations for excess dropout would be to having a zero value.

Statistically significant differences in Wave 1-

Wave 2 noninterview rates were observed for the following subgroups of the sample (with the magnitude of the excess dropout in parentheses): less perceived control over future health (2.07 percent), poorer self-rated health (6.02 percent), less active compared to 2 years previously (3.83 percent), lower How-Are-You Score (5.22 percent), fewer recent participations in groups (1.92 percent), fewer social contacts (4.23 percent), not married (4.69 percent), 1978 income less than $10,000 (5.09 percent), and other than white, non-Hispanic ethnicity (10.05 percent). There was a nonsignificant trend for education, in the direction of less than a high school diploma (3.65 percent). On these variables, the noninterview group followed the often observed pattern of greater loss among the less psychosocially and materially well-off. It appeared that, for the most part, the percentages were small, so that dropout biases would not pose a prohibitive problem for the investigation.

These Wave 1-Wave 2 results corresponded closely to an analysis carried out by the National Center for Health Statistics, comparing characteristics of the Wave 2 respondents with the entire Wave 1 sample (*21*). Discrepancies were minor and followed no systematic pattern; the impression again was of somewhat greater nonresponse among the less advantaged, but not prohibitively so. Overall, the conclusion was that the sociodemographic profile of the NSPHPC sample at Wave 2 was virtually the same as at Wave 1. The relatively larger differential dropout for the Wave 1 participants other than white, non-Hispanic was noted in both comparisons, however, and it may be important as discussed later in regard to outcomes of the analyses.

Data collection procedure. Sampling, interviews, and data preparation were performed by Chilton Research Services of Radnor, PA, under guidelines established by the National Center for Health Statistics. The survey was cosponsored by the Office of Disease Prevention and Health Promotion and the Division of Environmental Epidemiology of the National Center for Health Statistics, both agencies of the Public Health Service.

All interviews were conducted by telephone and averaged one-half hour to complete. Information in this analysis is therefore based on self-report. As noted, the reinterview rate for Wave 2 was 80.5 percent. The interview was designed to cover a broad range of health-related practices. In addition, numerous questions on social support, health status, and psychological status were asked. The Wave 2 instument was almost identical to that for Wave 1. More detailed information on data collection has been provided elsewhere (*22–24*).

Variables for analysis. This report is based on a representative, although not exhaustive set of indices from the NSPHPC survey. Health practices were selected to reflect a variety of types of behavior, as discussed subsequently. Predictor variables were chosen to include common sociodemographic indices and several psychosocial dimensions. Unless noted otherwise, Wave 1 and Wave 2 coding was identical.

Health practice variables. A total of nine health practice indices were used as dependent variables, derived from the following information:

1. Recency of seeing a dentist, a physician, and having an eye examination. A composite Health Visits Index was created for Wave 2, based upon whether each of these professionals had been visited since the Wave 1 interview (range = 0–3). The similar index for Wave 1 allowed having had an eye examination in the last 2 years.
2. Blood pressure check. A yes-no dichotomy was used, based upon whether the respondent reported having had a blood pressure check during the year before the Wave 1 interview, and between Waves 1 and 2.

These questions in 1 and 2 were chosen to represent indicators of health service use commonly considered to have preventive health behavior connotations. However, because of the wording of the questions, it is possible that preventive visits were not the only ones that were reported.

Other questions were selected as practices which might be performed regularly, if not necessarily daily. They included five habits.

3. Limiting red meat intake for health reasons, asked in the survey and therefore coded here simply as a yes-no dichotomy;
4. Use of seatbelts when riding in a car, coded as never, seldom, sometimes, or nearly always-always;
5. Use of dental floss or a water pick, coded as three times a week or more, once or twice a week, less than once a week, or never;
6. Glasses of water drunk per day, coded as less than one, one, two or three, four to six, or seven or more;

Table 1. Results of logistic regression analyses to predict limiting red meat and obtaining a blood pressure check in the past year, at Wave 2

Yes to limiting red meat[1]				*Blood pressure check within past year*[2]			
Predictor[3]	*(df)*	*Chi square or logistic coefficient*	*P value <*	*Predictor*[3]	*(df)*	*Chi square or logistic coefficient*	*P value <*
Limiting red meat, Wave 1	(1)	256.50[4]	.0000	Blood pressure check, Wave 1	(1)	127.62	.0000
Limiting salt, fat, sugar		15.62	.0000	Illness days in bed: more	(3)	22.03	.0000
Health in past year: worse	(2)	7.82	.02	Functional health: worse	(3)	12.93	.005
Education: more years	(4)	9.56	.05	Gender: women	(1)	9.14	.003
Employment: not full time	(1)	4.42	.04	Group participation: more	(2)	6.57	.04
				Regular source of care	(2)	21.65	.0000
				How Are You score: better		2.49	.007
				Stressor events: more		2.80	.003
Improvement in case identification:				Improvement in case identification:			
Using health practices		26.3 percent		Using health practices		14.7 percent	
Not using health practices		4.9 percent		Not using health practices		9.2 percent	

[1] Predictors that dropped out of step 1 analyses when health practices were added: age (older), gender (women), group participation (2 or more events), and ethnicity (nonwhite).

[2] Predictors that dropped out of step 1 analyses when health practices were added: health over past year (worse).

[3] Entries for some predictors include the direction of association. This practice is repeated in tables 2–5.

[4] Results are given as either chi-square (df) or standardized logistic coefficient, depending upon categorical versus continuous predictor variable.

Table 2. Results of ordinary least squares regression to predict health service visits and number of regular activities, at Wave 2

More health service visits[1]				*More regular activities*[2]			
Predictor	*Partial r*	*B value*	*P value <*	*Predictor*	*Partial r*	*B value*	*P value <*
More health visits: Wave 1	.380	.38	.000	More activities: Wave 1	.555	.54	.0000
Limit salt, fat, sugar	.065	.04	.003	Alameda 5-habit: more	.146	.22	.0000
Gender: women	.067	.13	.002	Limit salt, fat, sugar	.073	.08	.0005
Age: older	.057	.004	.007	Age: younger	−.180	−.02	.0000
Group participation: more	.066	.07	.002	Group participation: more	.128	.21	.0000
Regular source of care	−.093	−.23	.0000	Functional health: better	.058	.09	.006
Education: more years	.043	.04	.05	Health in past year: same/worse	−.069	−.19	.002
Income: higher	.060	.05	.005	Income: higher	.052	.07	.02
				Marital status: not married	−.056	−.18	.008
With behaviors as predictors: $R = .448$, $R^2 = .239$				With behaviors as predictors: $R = .718$, $R^2 = .515$			
Without behaviors as predictors: $R = .311$, $R^2 = .097$				Without behaviors as predictors: $R = .514$, $R^2 = .265$			

[1] Predictors that dropped out of step 1 analyses when health practices were added in step 2: health over past year (worse).

[2] Predictors that dropped out of step 1 analyses when health practices were added in step 2: future control over health (stronger), self-rated health (better), years of education (more), employment (not full time).

7. Cups of coffee drunk per day, coded as less than one, one, two, three, four or five, or six or more.

Finally, two indices were selected as summary measures.

8. The Five-Habit Alameda County Score, consisting of habits of smoking, drinking, sleep, and physical activity and weight relative to height. Eating breakfast and snacking between meals were not included, given the current preference to omit these habits from the original seven-item index (*25*). Classification and coding of the five habits were done by the NSPHPC on a 0–5 scale, and recoded for this report as 0–2, 3, 4, or 5 practices because of the relatively few persons in the 0–1 practice groups.

9. Number of free-time activities reported being done at least "sometimes" or "often." These were summarized across the following areas: swimming in the summer, jogging or running, taking long walks, riding a bicycle, having a physically active hobby, doing calisthenics-exercise, or taking part in any other active sport not mentioned by the interviewer. This regular activities variable could

Table 3. Results of ordinary least squares regression analyses to predict the Alameda 5-habit score and use of seatbelts, at Wave 2

Great number, Alameda 5-habits score[1]				*Regular use of seatbelt*[2]			
Predictor	*Partial r*	*B value*	*P value <*	*Predictor*	*Partial r*	*B value*	*P value <*
Alameda 5-habit: Wave 1	.603	.59	.0000	Seatbelt use: Wave 1	.696	.67	.0000
Regular activities: more	.144	.06	.0000	Limit salt, fat, sugar	.078	.05	.0002
Functional health: better	.053	.04	.02	Alameda 5-habit: more	.049	.05	.02
Gender: women	.075	.12	.0003	Regular activities: more	.049	.03	.02
Education: more years	.049	.03	.02	Education: more years	.055	.05	.009
Group participation: fewer	−.043	−.04	.04	Age: older	.056	.04	.008
Employment: not full time	−.054	−.09	.01	Functional health: better	.047	.04	.03
With behaviors as predictors: $R = .671$, $R^2 = .451$ Without behaviors as predictors: $R = .329$, $R^2 = .108$				With behaviors as predictors: $R = .734$, $R^2 = .538$ Without behaviors as predictors: $R = .271$, $R^2 = .073$			

[1] Predictors that dropped out of step 1 analyses, when health practices were added: age (younger), self-rated health (better), income (lower).

[2] Predictors that dropped out of step 1 analyses when health practices were added: future control over health (stronger), group participation (more), regular source of care (yes), ethnicity (nonwhite).

therefore take on a range of values from 0 to 7. Coding was stricter than that used for the Alameda score's physical activity component, being defined for this index as a count of activities done often, in contrast to a dichotomous summary code of active-inactive.

Comparison of Wave 1 responses by those interviewed twice with those interviewed once indicated that there was no differential dropout for any of the nine practices just listed. This observation supports the generally small magnitudes of attrition along background characteristics of the sample discussed previously.

Predictor variables. The set of 17 Wave 2 variables chosen as predictors were selected to represent broad psychosocial and demographic domains. Included were age, gender, income, ethnicity (white, non-Hispanic and all other), employment status (full time or other), highest educational level completed, and having a regular source of health care (yes-no).

A variable for perceived control over future health was coded as none-very little, some, or a great deal. Trend in health over the past year was coded as worse, same, or better. A life events score calculated by the NSPHPC was also employed, based upon responses to seven possibly stressful events that might have occurred over the past year. Higher scores indicated relatively more stress-producing circumstances. Along similar lines a "How Are You (HAY)" Scale was used, also as calculated by the NSPHPC, to represent general feelings of malaise in contrast to a favorable view of life. Higher scores represented a better perception of one's current life.

Three components of Berkman's social network score (*25*) were used individually. These were marital status (married or nonmarried), sociability (based on availability and contact with close friends and relatives, coded as low, medium, high, or very high), and membership or participation in group events over the past 3 months (for example, labor union, fraternal, business society, or charity, coded as none, one event, or two or more events).

A subjective report of present health was coded as excellent, good, or fair-poor-not sure. A functional health indicator of limitation of physical activity due to illness was coded in four categories, based directly upon the NSPHPC scheme: healthy and high energy; healthy now, but respondent reported low energy compared to age peers or up to 8 bed-disability days in past year; some limitation, but not for a major activity; or marked limitation in a major activity of activities of daily living (ADL) task. Finally, bed-disability days during the past year were coded as none, 1 or 2 days, 3 to 7 days, or 8 days or more.

Among the few questions that were added in Wave 2, a set of three asked for separate reports (yes-no) of the limitation of salt, fat, and sugar intake in one's daily diet. Because these were not asked at Wave 1, a composite index was created (range = 0–3) and used as a predictor variable for the second step of data analyses, discussed in the next section.

Results

Analyses were based upon ordinary least squares regression for all health practice indices except

Table 4. Results of ordinary least squares regression analyses to predict use of dental floss or water-pick device and cup of coffee per day, at Wave 2

More frequent use of floss or water-pick[1]				*Fewer cups of coffee per day*[2]			
Predictor	*Partial r*	*B value*	*P value <*	*Predictor*	*Partial r*	*B value*	*P value <*
Use of floss or pick: Wave 1 ...	.666	.66	.0000	Cups of coffee: Wave 1	.812	.79	.0000
Health visits: more	−.089	−.09	.0000	Alameda 5-habit: more.....	−.063	−.07	.003
Limit salt, fat, sugar	−.056	−.04	.01	Ethnicity: nonwhite	−.078	−.22	.0003
With behaviors as predictors: $R = .722$, $R^2 = .522$				With behaviors as predictors: $R = .841$, $R^2 = .707$			
Without behaviors as predictors: $R = .320$, $R^2 = .102$				Without behaviors as predictors: $R = .331$, $R^2 = .109$			

[1] Predictors that dropped out of step 1 analyses when health practices were added: self-rated health (better), gender (women), education (more years), group participation (more), income (higher).

[2] Predictors that dropped out of step 1 analyses when health practices were added: age (younger), bed days due to illness (more), gender (women), education (more years), stressor events (lower score), marital status (not married), income (lower).

limiting red meat and obtaining a blood pressure check in the year between Waves 1 and 2. Logistic regression was used for these two indices, due to the dichotomous response format. Results are presented in tables 1-5.

The analyses for each health practice index proceeded in two steps. In the first step, only the 17 psychosocial, health status, and demographic predictors described previously were used. This analysis provided a baseline value of the variance among people that could be explained or accounted for by the predictors. Then in the second analysis, the corresponding Wave 1 health practice index was added as a predictor, along with the following Wave 2 health practice indices: the Alameda Five-Habit Score, the Health Visits Index (dental, medical, eye examination), the Regular Activities Index, and the salt-fat-sugar composite. A comparison of the first and second analyses therefore gives an estimate of how much the prediction of health behavior can be improved when health practices are added.

Looking at the partial correlations and regression coefficients for the Wave 1 practices gives an indication of behavioral stability between Waves 1 and 2, with higher values reflecting greater stability. The Wave 2 practices added in the second step represented diverse types of behavior (health service use, dietary practices, physically active leisure pursuits, lifestyle habits), and they were included to examine how important health practices other than the Wave 1 assessment of the target behavior would be as predictors.

Results of regression analyses. Table 1 presents the results obtained from the logistic regressions for the practice of limiting red meat intake and for having had one's blood pressure checked over the past year. The data shown in the body of this table and in tables 2-5 are from the second step of analysis, which included the Wave 1 and Wave 2 health practices as predictors. However, the footnotes to tables 1-5 do list those predictors significant in the first-step analyses that subsequently failed to achieve significance in the second analysis.

The results in table 1 set the pattern that was observed even more strongly for the other practices. As noted at the bottom of the table, predictive power tended to be rather low when only the psychosocial and demographic variables were used in the first step of analysis (4.9 percent, 9.2 percent). When the Wave 1 indices for the two target practices were added in the second step, they became by far the strongest predictors of their respective Wave 2 measures as shown by the large chi-square values, suggesting the importance of behavioral stability. In contrast, the Wave 2 health practices that were also added in the second analysis were not very prominent in the outcome, except that persons who reported more limitation of their salt, fat, and sugar intake also tended to report limiting red meat. The dietary basis shared by both indices makes the strength of this association understandable. The improvement in predictive power between the first and second analysis was relatively larger for limiting red meat intake. The improvement for obtaining a blood pressure check was by far the smallest observed for any of the behaviors.

Table 2 presents the results for the Health Visits Index and for the Regular Activities Index. Improvements in predictive power were in the range of a doubling of the magnitude from the step one analyses, as reflected by comparison of the two multiple regression R^2 values. A notably larger R^2

Table 5. Results of ordinary least squares regression analyses to predict glasses of water drunk per day, at Wave 2[1,2]

Predictor	Partial r	B value	P value
Glasses of water: Wave 1....	.656	.62	.0000
Age: older.....	.091	.007	.0000
Social network: larger	.047	.04	.03
Regular activities: more	.044	.02	.04
Health in past year: worse ...	−.058	−.11	.007

With behaviors as predictors: $R = .681$, $R^2 = .464$
Without behaviors as predictors: $R = .215$, $R^2 = .046$

[1] Predictors that dropped out of step 1 analyses when health practices were added: gender (men), income (lower), ethnicity (nonwhite).
[2] Direction of response being predicted: more glasses per day.

value was achieved at both steps by the Regular Activities Index. As the magnitude of the partial correlations and multiple regression beta weights (B values) indicate, the Wave 1 indices were by far again the strongest predictors. The Alameda Five-Habit Score did, however, make a relatively strong showing as a predictor of regular activities, perhaps because healthier persons have more physical reserve to devote to the types of activities upon which the Regular Activities Index was based. The Five-Habit Score also has a physical activity component as one habit, which may inflate the association despite the differences in coding. The index for limiting salt, fat, and sugar in the diet was again significant, this time being positively associated with both target health practices.

Results for the Alameda Five-Habit Score and for use of seatbelts are presented in table 3. The major predictors again were the Wave 1 indices for the target health practices. Increments in the two R^2 estimates of explained variance were substantial, the Alameda Score increasing by a factor of four, and seatbelt use by about seven. Although some Wave 2 health practices achieved statistical significance, their contribution again was still modest.

The analyses for use of dental floss or water pick and for coffee drinking are shown in table 4. Although the number of predictors was small, the magnitude of the explained variance and the regression coefficients and partial correlations for the Wave 1 indices show a strong habitual component to the practices. Interestingly, the only additional predictors in the second-step analyses for use of dental floss or a water pick device were other Wave 2 health practices.

Finally, table 5 gives the results for daily water intake. The pattern by now was familiar, with the large increase in variance explained by the second analysis being attributable primarily to the Wave 1 index. The Regular Activities Index was of borderline importance, and no other Wave 2 behaviors achieved significance.

Partial correlations within sample strata. Having obtained partial correlations as estimates of the stability of a practice between Wave 1 and Wave 2, another question was whether or not the magnitude of the association was similar or different within strata of the sample. Tables 6 and 7 therefore present partial correlations between the Wave 1 and Wave 2 indices for several strata. The health practices chosen were those seven measured on other than a yes-no dichotomy (that is, those in tables 2–5).

The sample strata included age (determined at Wave 1: 20–30, 31–41, 42–53, 54–64); gender; ethnicity (white, non-Hispanic or all other); educational level (high school or less, some college, or college graduate); 1979 income (less than $15,000, $15,000–$24,999, more than $25,000); self-rated health (poor-fair-not sure, good, excellent); and functional health (some limitation of activity, no limitation of activity). The variables controlled for in the partial correlations were the same set of psychosocial and demographic predictors used in the regressions.

Overall, the results in tables 6 and 7 show that the partial correlations were very consistent across levels of the stratifying variables. For any of the seven health practices, the partial correlations did not differ by more than .10 among the strata for gender, functional health, and self-rated health. Age and education each had only one health practice for which the partial correlations within strata differed by .10–.13. For the lowest group in the income strata, the partial correlations were lower for health service visits and for use of seatbelts by .10–.13, implying slightly less stability in these two areas. Three practices seemed to show less stability for the other than white, non-Hispanic participants (that is, Alameda Five-Habit Score, use of seatbelts, use of floss or water pick). Given the greater differential dropout of Hispanic and nonwhite Anglo participants from Wave 1 to Wave 2, these instances of lower stability do seem important.

Discussion

Results from this investigation provided empirical evidence supporting the hypothesis that initial

Table 6. Results of partial correlations of Wave 1 with Wave 2 health practice indicators, holding psychosocial and demographic variables constant, within selected sample strata of age, functional health, and self-rated health

Health practices	Age (years)				Functional health		Self-rated health		
	20–30	31–41	42–53	54–64	Limited	Not limited	Low	Middle	High
Regular activities	.53	.55	.58	.59	.53	.57	.51	.56	.56
Health service visits	.30	.40	.40	.43	.41	.37	.38	.38	.38
Alameda 5-habit score	.57	.61	.58	.65	.58	.61	.59	.59	.64
Use seatbelts	.70	.70	.68	.69	.69	.70	.65	.67	.74
Cups of coffee per day	.75	.83	.83	.83	.80	.82	.79	.80	.83
Glasses of water per day	.64	.66	.69	.64	.66	.65	.68	.65	.66
Use floss or water pick	.62	.69	.71	.65	.66	.67	.62	.66	.69

Table 7. Results of partial correlations of Wave 1 with Wave 2 health practice indicators, holding psychosocial and demographic variables constant, within selected sample strata of education, income, gender, and ethnicity

Health practices	Education (years)		Income (1,000s)			Gender		Ethnicity	
	12 or less	More than 12	Less than $15	$15–$24	More than $25	Men	Women	White, non-Hispanic	All other
Regular activities	.56	.55	.55	.55	.56	.54	.57	.56	.55
Health service visits	.38	.39	.34	.36	.44	.41	.36	.39	.32
Alameda 5-habit score	.59	.63	.58	.63	.60	.59	.61	.62	.51
Use seatbelts	.65	.75	.63	.72	.74	.70	.69	.71	.60
Cups of coffee per day	.81	.81	.80	.82	.81	.80	.82	.81	.78
Glasses of water per day	.66	.65	.64	.65	.67	.65	.66	.66	.63
Use floss or water pick	.65	.70	.64	.68	.69	.67	.66	.69	.52

reports of health practices would be the best predictors of those practices 1 year later. The tendency clearly was for behavioral practices to persist. Moreover, as noted in tables 1–5, the increments in prediction were generally substantial relative to the baseline values of explained variance obtained in the first step of analysis, before health practices were added to the equation in the second step. One year, although a brief time by some standards, is a sizable interval in other situations, and the events in most persons' lives over even 1 year are not completely static. The degree of stability that seemed to exist over the 1 year between Waves 1 and 2 of the NSPHPC should therefore not be taken for granted. Reasons for the persistence of health practices, even across this time period, should be studied.

Having drawn this general conclusion, certain qualifications and considerations might be added. It should be emphasized that the results in tables 1–7 do not address questions of behavior stability involving the prospects for successfully achieving objectives through interventions. In essence, evidence for stability was observed in a national sample among whom health promotion-disease prevention programs were not being systematically introduced. Nor can these data be applied to specific local or State circumstances, such as compliance with seatbelt laws or smoking bans in public or work settings. The data presented are most pertinent to the stability of practices we might expect to observe "all else being equal," and they are therefore not intended to imply rigidity or intractability to change. Nonetheless, the force of habit appears to be a major consideration, which can undoubtedly act as a two-edged sword. In this regard, additional analyses of the NSPHPC data will need to investigate whether desired and undesired practices exhibit comparable degrees of stability.

Another point is that the NSPHPC did not include a way to distinguish true behavioral stability (or instability) from unreliability of the health practice questions themselves. However, if unreliability of the questions were a major problem, one would have expected the Wave 1-Wave 2 partial correlations and regression coefficients to be much lower, since both assessments would have had sizable random error, thereby seriously diluting the correlations. In fact, it was the Wave 2 health practices that showed the less strong associations, which is consistent with the only modest correla-

'Nonetheless, the force of habit appears to be a major consideration, which can undoubtedly act as a two-edged sword. In this regard, additional analyses of the NSPHPC data will need to investigate whether desired and undesired practices exhibit comparable degrees of stability.'

tions usually observed across different health-related practices.

Other aspects of the results also need to be mentioned. One finding is that increments in predictive power were not uniform across the several target practices. A blood pressure check within the past year showed the least improvement; nor was the Health Visits Index reflecting medical, dental, and eye examinations characterized by a marked increase relative to the other health practices. Perhaps the nature of health service visits is that they are more strongly influenced by the schedule considered necessary by the professional. Therefore, the predictive power of any variable, including personal habits, would be attenuated. In contrast, coffee drinking, water intake, the Alameda index, use of dental floss or a water pick device, and use of seatbelts exhibited large increments. The influence of habit-forming products (for example, caffeine, nicotine, alcohol), the tendencies for lifestyle practices to persist, and the influences of psychosocial and contextual factors would seem to have maximum opportunity to be reflected in these behaviors.

In regard to the question of generalizability of improvement in prediction, it seems that the increments in predictive power were attributable almost exclusively to the Wave 1 index. Although the Wave 2 health behavior variables achieved statistical significance in several analyses, their magnitudes of association did not approach the levels of the Wave 1 indices; they were, in fact, much closer to those for the psychosocial and demographic variables. It was also interesting that the Wave 2 Health Visits Index achieved significance as a predictor only for the use of dental floss or water pick. In turn, this association was attributable primarily to the dental examinations component of the health visit variable (data not shown). This outcome reflects an independence of health services use from other health practices that needs to be investigated further.

Partial correlations within strata of the sample indicated that the degree of association between Wave 1 and Wave 2 practices held up rather well. The few exceptions were not of an extreme magnitude, although nonwhite ethnicity deserves special attention, particularly in light of the relatively greater attrition in this group between Waves 1 and 2. If there was any tendency for persons not interviewed at Wave 2 to have less stable health practices, then these results for the nonwhite respondents may actually *underestimate* a tendency for their practices to be less stable. Due to the relatively small nonwhite sample, it is important to further investigate this possibility with larger samples having greater generalizability.

Despite the major focus of this investigation, the intent was not to ignore other predictors that could give useful insights about the correlates of health-related activities. The footnotes to tables 1–5 list the psychosocial and demographic predictors that were eliminated from statistical significance when the behavioral predictors were added in step two. In searching for predictors that are important across several health practices, attention to the excluded variables is informative. From the standpoint of having achieved significance at least in the first-step regressions, years of education was important for seven of the nine health practice indices, with the better educated tending to give more favorable reports. Gender and participation in group events over the last 3 months also appeared for seven practices. Usually, this was in favor of women (except for water intake), and in favor of those persons with more participation (except for the Alameda index). Age was a predictor for seven practices, but the direction of association was split very evenly between an advantage to younger and older respondents.

A judgment of a trend toward worse health over the year between Waves 1 and 2 was associated with five practices, suggesting that threats to health can prod individuals to action, perhaps due to medical necessity if nothing else. At the same time, self-ratings of better health, less limitation of functional activity, and perceiving control over future health usually had a positive correlation with health practices (other than health service visits). Perhaps this indicates that fundamental assessments of health status still need to be favorable even if current problems are perceived.

It is certainly necessary to replicate this type of investigation with other samples. It would be

desirable to have a better proportional representation of men, so that population estimates do not contain biases in the direction that exists for women. Varying the time frames between behavioral assessments will also be important. Most intervals will be longer than the 1 year in this study, but it is possible to use shorter periods, especially if seasonal variation of health practices is the topic of interest. It will also be an important next step to highlight those persons who reported change in their health practices, for better or for worse. Excluding the persons who remain stable may improve our ability to identify psychosocial and demographic correlates of change, even though the extent of change is not great over a brief period.

Finding answers to the basic question, "Where do health behaviors come from?", is essential. Over longer periods, the smaller portions of variance usually explained by individual psychosocial and sociodemographic predictors in cross-sectional studies may accurately reflect the gradual but progressive development over a lifetime, of a repertoire of personal lifestyle practices. Over short periods, one of the best answers may well be that current behaviors tend to be based on the persistence of habit, how ever that habit was developed.

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